Chapter 7 Section 2: Comparing Two Means

- **We want to compare…** 2 different samples
- **Each group is considered…** a sample from a diff. pop.
- **Responses in each group are…** independent

2-Sample T-test

Same steps for the test of significance:

1. Assump.
2. Hyp.
3. Test Stat
4. P-value
5. Concl.

letters

2 populations with each of their statistics and parameters... (denoted with numbers)

	Pop. 1	Pop. 2
population mean	μ_1	μ_2
population std. dev.	σ_1	σ_2
sample size	n_1	n_2
sample mean	$\bar{x}_1$	$\bar{x}_2$
sample std. dev.	s_1	s_2

Hypotheses:

- Are comparing... 2 means

Ho: $\mu_1 = \mu_2$ OR $\mu_1 - \mu_2 = 0$

Ha: $\mu_1 \gtrless_{\neq} \mu_2$ $\quad \mu_1 - \mu_2 \gtrless_{\neq} 0$

* no #'s

Test Statistic:

$$t = \frac{(\bar{x}_1 - \bar{x}_2)}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$$

Generic

$$\frac{\text{statistic} - \text{param.}}{(\text{std. dev. of stat.})}$$

P-Value: $P(t \gtrless \underline{\text{test stat}} \mid df = \quad)$

- **Degrees of freedom:**
  - smaller of $n_1 - 1$ or $n_2 - 1$
  - * **(Textbook, p. 549)**

    calculator gives df
    * decimals

Conclusion:

Almost the same 2 sentences…

$H: \mu_1 \gtrless\neq= \mu_2$

- same
- We have suff. evid. that the mean of $\underline{\#1}$ is $\underline{> < \neq}$ to the mean of $\underline{\#2}$.

Calculator: 2 samp T-test Pooled: NO

2-Sample T-Interval

Formula:

$$\left((\bar{x}_1 - \bar{x}_2) \pm t^* \sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}} \right)$$

Generic:

statistic ± (crit. value)(Std. dev. of stat.)

= (,)

- Degrees of Freedom: (same)

*write down

INTERPRETATION:

$\mu_1 - \mu_2$

We are ____% conf. that the difference between μ_1 and μ_2 is btw. ____ and ____ units.

Calculator: 2 samp T-Int

ASSUMPTIONS: (for both 2 sample t-test and t-interval)

* 2 independent SRS

* 2 normal pop's

or

n_1
$n_2 \geq 30$

Example:

We are trying out a new teaching style that we think will increase test scores. Below is the data for both the treatment and control groups.

	n	$\bar{x}$	s
Treatment	21	81.48	8.12
Control	23	77.85	7.98

Test these hypotheses

$H_0: \mu_T = \mu_c$

$H_a: \underline{\mu_T} > \mu_c$

$$t = \frac{\bar{x}_T - \bar{x}_c}{\sqrt{\frac{s_T^2}{n_T} + \frac{s_c^2}{n_c}}} = 1.493$$

$$P(t > 1.493 \mid df = 41.493) = 0.0715$$

- We fail to reject Ho b/c p-value > α = 0.05
- We have suff. evid that the mean of trt is equal to the mean of control.

Create and interpret a 95% confidence interval

$$(\bar{X}_T - \bar{X}_C) \pm t^* \sqrt{\frac{S_T^2}{n_T} + \frac{S_C^2}{n_C}}$$

$$\mu_1 - \mu_2 = 0$$

$$= (-1.277, 8.5372)$$

We are 95% confident that the difference between the means of trt. and control is btw. -1.277 and 8.5372 pts.

* 0

Worksheet: #1 -- 4

Chapter 7 Section 2: Comparing Two Means

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- **Each group is considered…**

- **Responses in each group are…**

2-Sample T-test

Same steps for the test of significance:

1.

2.

3.

4.

5.

2 populations with each of their statistics and parameters... (denoted with numbers)

	Pop. 1	**Pop. 2**
population mean		
population std. dev.		
sample size		
sample mean		
sample std. dev.		

Hypotheses:

- Are comparing…

Ho:

OR

Ha:

Test Statistic:

t =

P-Value:

- **Degrees of freedom:**
  -
  - **(Textbook, p. 549)**

Conclusion:

Almost the same 2 sentences…

-
-

Calculator:

2-Sample T-Interval

Formula:

- Degrees of Freedom:

INTERPRETATION:

Calculator:

<u>ASSUMPTIONS:</u> (for both 2 sample t-test and t-interval)

*

*

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Worksheet: #1 -- 4